

## Hans Geiger—German Physicist and the Geiger Counter

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The German physicist Hans Wilhelm Geiger is best known as the inventor of the Geiger counter to measure radiation. In 1908, Geiger introduced the first successful detector of individual alpha particles. Later versions of this counter were able to count beta particles and other ionizing radiation. The introduction in July 1928 of the Geiger-Müller counter marked the introduction of modern electrical devices into radiation research.

Geiger, the eldest of 5 children of a professor of philology, was born on September 30, 1882, in Neustadt an der Hardt, Rhineland-Palatinate state in western Germany (about 20 miles southwest of Mannheim). He studied physics at the universities of Munich and Erlangen in Bavaria, Germany, and received the PhD degree from the latter university in 1906. At the University of Erlangen, he worked with Eilhard Wiedemann (1852-1928) and wrote a thesis on electrical discharges through gases.

Geiger received a fellowship that enabled him to work as an assistant to physicist Arthur Schuster (1851-1934) at the University of Manchester (England). After Schuster's retirement in 1907, Geiger continued to work with Schuster's successor, Ernest Rutherford (1871-1937). In 1908, Rutherford and Geiger devised a counter for alpha particles, work that led to Rutherford's nuclear theory of the atom, for which he won the 1908 Nobel Prize in chemistry. They used the counter and other radiation detectors in experiments that led to the identification of the alpha particle as the nucleus of the helium atom and to Rutherford's correct proposal (1912) that, in any atom, the nucleus occupies a very small volume at the center. Geiger remained in England until 1912, when he was named head of the German National Institute of Science and Technology in Berlin, where he continued his studies on atomic structure and radiation counting.

In 1913, Geiger was joined by two physicists, Walther Bothe (1891-1957), later the 1954 Nobel Prize winner in



physics, and James Chadwick (1891-1974), later Sir James Chadwick and winner of the 1935 Nobel Prize in physics. Bothe investigated alpha scattering, and Chadwick counted beta particles. The work was interrupted in 1914, with the beginning of World War I (1914-1918). Geiger served in the German army in the field artillery.

After the war, Geiger returned to his work, and in 1924, he used his device to confirm the Compton effect, namely, the increase in wavelength of electromagnetic radiation, especially of an X-ray or gamma-ray photon, scattered by an electron. The Compton effect was discovered by the American physicist Arthur Holly Compton (1892-1962), for which he was awarded the 1927 Nobel Prize in physics.

In 1925, Geiger accepted his first teaching position, which was at the University of Kiel, Germany. Here, he and Walther Müller improved the sensitivity, performance, and durability of the counter, and it became known as the "Geiger-Müller counter." It could detect not only alpha particles but also beta particles (electrons) and ionizing photons. The counter was essentially in the same form as the modern counter.

In 1929, Geiger moved to the University of Tübingen (Germany), where he was named professor of physics and director of research at the Institute of Physics. In 1929, while at the Institute, Geiger made his first observations of a cosmic-ray shower. Geiger continued to investigate cosmic rays, artificial radioactivity, and nuclear fission after accepting a position in 1936 at the Technische Hochschule in Berlin, a position he held until his death. In 1937, with Otto Zeiller, Geiger used the counter to measure a cosmic-ray shower.

During World War II (1939-1945), Geiger participated briefly in Germany's abortive attempt to develop an atomic bomb. In June 1945, Geiger fled the Russian occupation of Berlin and went to nearby Potsdam, where he died on September 24, 1945, at the age of 62 years, less than 2 months after the American atomic bomb was dropped on Hiroshima, Japan.

Geiger was honored on a stamp (Scott No. 2182) issued in 1998 by Antigua and Barbuda.

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